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The Resources Agency
DEPARTMENT OF FISH AND GAME

STANDING STOCKS OF FISHES IN SECTIONS OF BIG GRIZZLY CREEK PLUMAS COUNTY, 1991

by

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INTRODUCTION

The Department of Water Resources (DWR) initiated an instream flow program in 1976 to identify streams that would benefit from flow enhancement, to assess instream values, and identify actions such as habitat manipulation that could enhance these streams. The Northern District of DWR selected Big Grizzly Creek below Lake Davis (Figure 1) as one of the streams to study under this program.

Previous sampling effort on Big Grizzly Creek has been conducted by Department of Fish and Game (DFG) biologists. Initial estimates of rainbow trout (Oncorhynchus mykiss) populations were made by the DFG in 1976 (Brown 1976). The DFG also surveyed the creek in 1981 and 1986 to estimate standing stocks of brown trout (Salmo trutta) and rainbow trout in selected stations (Bumpass et al. 1989).

The objective of this study is to estimate the number, age, and growth of trout in stations established in 1976. The stations were originally established to set baseline conditions with which future changes in seasonal stream flow or other elements of habitat would be compared. A report discussing twenty-five years of fisheries studies on Big Grizzly Creek will be prepared in the year 2001.

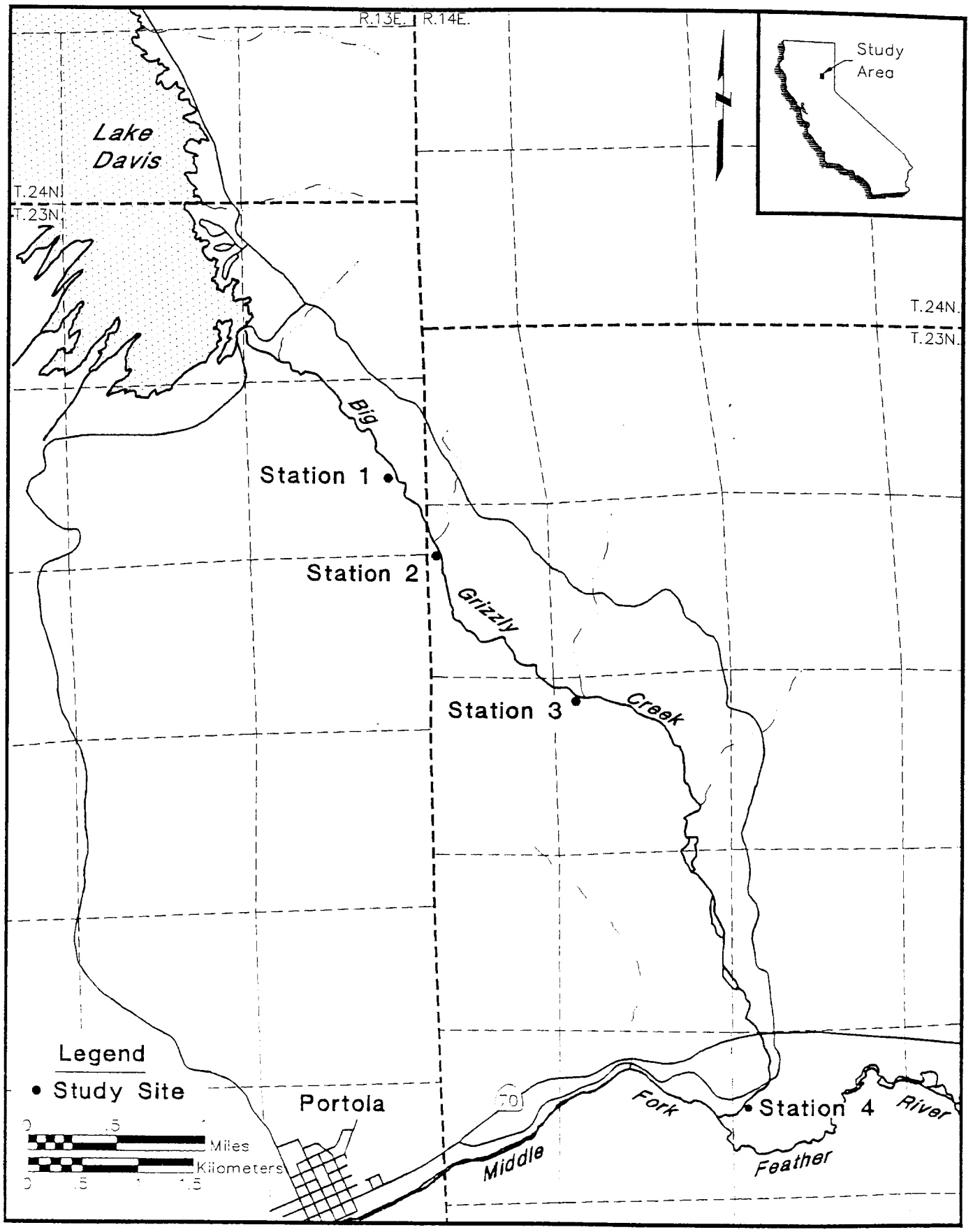

Figure 1. Stations sampled to estimate standing crop of trout in Big Grizzly Creek, 1991.

METHODS

Standing stocks of fishes were estimated in four fish population stations in Big Grizzly Creek (Figure 1) in Plumas County. Fish were sampled in riffles and small pools. Stations varied in length from 43.6 to 104.5 meters, according to the availability of suitable sampling water (Appendix 1). The length, average width, and average depth of each section were measured with a cloth tape. Fish were captured with a battery-powered backpack electroshocker (Smith-Root, Type VII) in stream sections blocked by seines. Captured fish were removed from the net-enclosed section on each pass.

Standing stock estimates were developed using the two-count method of Seber and LeCren (1967) or the multiple-pass method of Leslie and Davis (1939) with limits of confidence computed using a formula proposed by DeLury (1959).

The fork length (FL) of each fish was measured to the nearest millimeter. The weights of rainbow trout and brown trout were determined by displacement. Weights were also measured for Sacramento sucker (Catostomus occidentalis), green sunfish (Lepomis cyanellus), and brown bullhead (Ictalurus nebulosus).

Scales were dry mounted between microscope slides and their images were projected on a NCR microfiche reader at a magnification of 42X. Scale measurements for the calculation of growth were recorded to the nearest millimeter along the anterior radius of the anterior-posterior axis of the

scale.

Geometric mean functional regressions were used to describe the body-scale and length-weight relationships (Ricker 1975). Estimation of true mean growth rate was calculated using methods of Ricker (op. cit.).

Distribution of all fish caught is listed according to location. Standing crops of rainbow trout, brown trout, and nongame fishes were calculated for individual stations. Age, growth, and mean individual growth were calculated for rainbow trout and brown trout. Age and catch percentages as well as length and weight relationships were determined for rainbow trout and brown trout. The coefficient of condition and 95 percent confidence intervals were calculated for rainbow trout and brown trout.

RESULTS

Distribution

Rainbow trout were caught in each station. Brown trout, Sacramento sucker, green sunfish and brown bullhead were caught in station 4, the lowest station sampled (Table 1).

TABLE 1. Distribution of Fishes in Sections of Big Grizzly Creek Plumas County, 1991.

	Station Number			
	1	2	3	4
Distance below Grizzly Valley Dam (km)	2.5	3.2	4.8	9.7
Brown trout				X
Rainbow trout	X	X	X	X
Sacramento sucker				X
Green sunfish				X
Brown bullhead				X

Standing Crop

Rainbow trout were the most common game fish caught in Big Grizzly Creek. Biomass averaged 6.5 g/m^2 in four stations (Table 2). Catchable rainbow trout ($\geq$127 mm FL) biomass averaged 5.8 g/m^2. We found brown trout in only one station. Biomass in that station was 1.7 g/m^2 (Table 3). Biomass was also estimated for other nongame fishes (Table 4).

TABLE 2. Estimate of Rainbow Trout Standing Crop in Big Grizzly Creek, Plumas County, 1991.

Distance Below Grizzly Valley Dam (km)	Population Estimate	95% Confidence Interval	Biomass (g/m^2)	Estimate of Catchable Trout ($\geq$ 127 mm FL)	Biomass of Catchable Trout (g/m^2)
2.5	78	75-179	12.7	69	11.4
3.2	83	73-96	8.7	48	7.8
4.8	25	24-29	3.2	17	2.9
9.7	29	29-37	1.3	5	0.9

TABLE 3. Estimate of Brown Trout Standing Crop in Big Grizzly Creek, Plumas County, 1991.

Distance Below Grizzly Valley Dam (km)	Population Estimate	95% Confidence Interval	Biomass (g/m^2)	Estimate of Catchable Trout ($\geq$ 127 mm FL)	Biomass of Catchable Trout (g/m^2)
9.7	11	10-16	1.7	4	1.5

TABLE 4. Estimate of Standing Crop of Nongame Fishes in Big Grizzly Creek, Plumas County, 1991.

Distance Below Grizzly Valley Dam (km)	Species	Population Estimate	95% Confidence Interval	Biomass(g/m^2)
9.7	Brown bullhead	1	1-1	0.07
9.7	Sacramento sucker	15	14-20	0.1
9.7	Green sunfish	4	4-4	0.2

Length and Weight

Age group 0+ rainbow trout represented 43 percent of the 204 rainbow trout caught. Ages 1+ and 2+ comprised 44 percent and 13 percent respectively (Figure 2 and Appendix 2). Age group 0+ brown trout made up 42 percent of the 49 brown trout caught. Ages 1+ and 2+ comprised 25 percent and 33 percent respectively (Figure 3 and Appendix 4).

The relationship between fork length (L) and weight (W) of rainbow trout for Big Grizzly Creek is:

$Log_{10}W = -4.7 + 2.9\ Log_{10}L$

$r^2 = 0.99$

N = 204 (Figure 4 and Appendix 3)

The same relationship for brown trout is:

$Log_{10}W = -4.8 + 2.9\ Log_{10}L$

$r^2 = 0.99$

N = 49 (Figure 5 and Appendix 5)

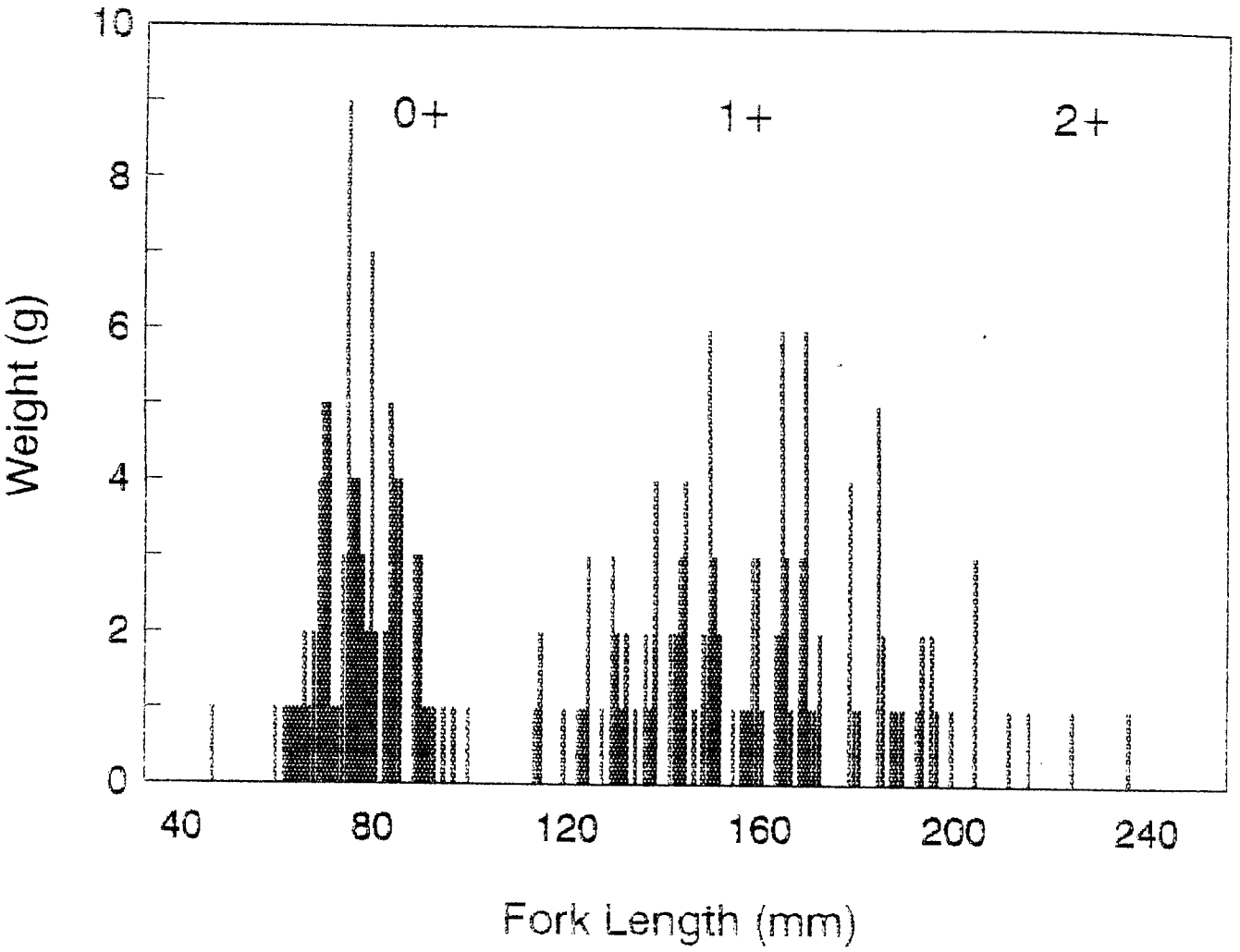

FIGURE 2. Length, observed frequency, and age of rainbow trout caught in Big Grizzly Creek, Plumas County, 1991.

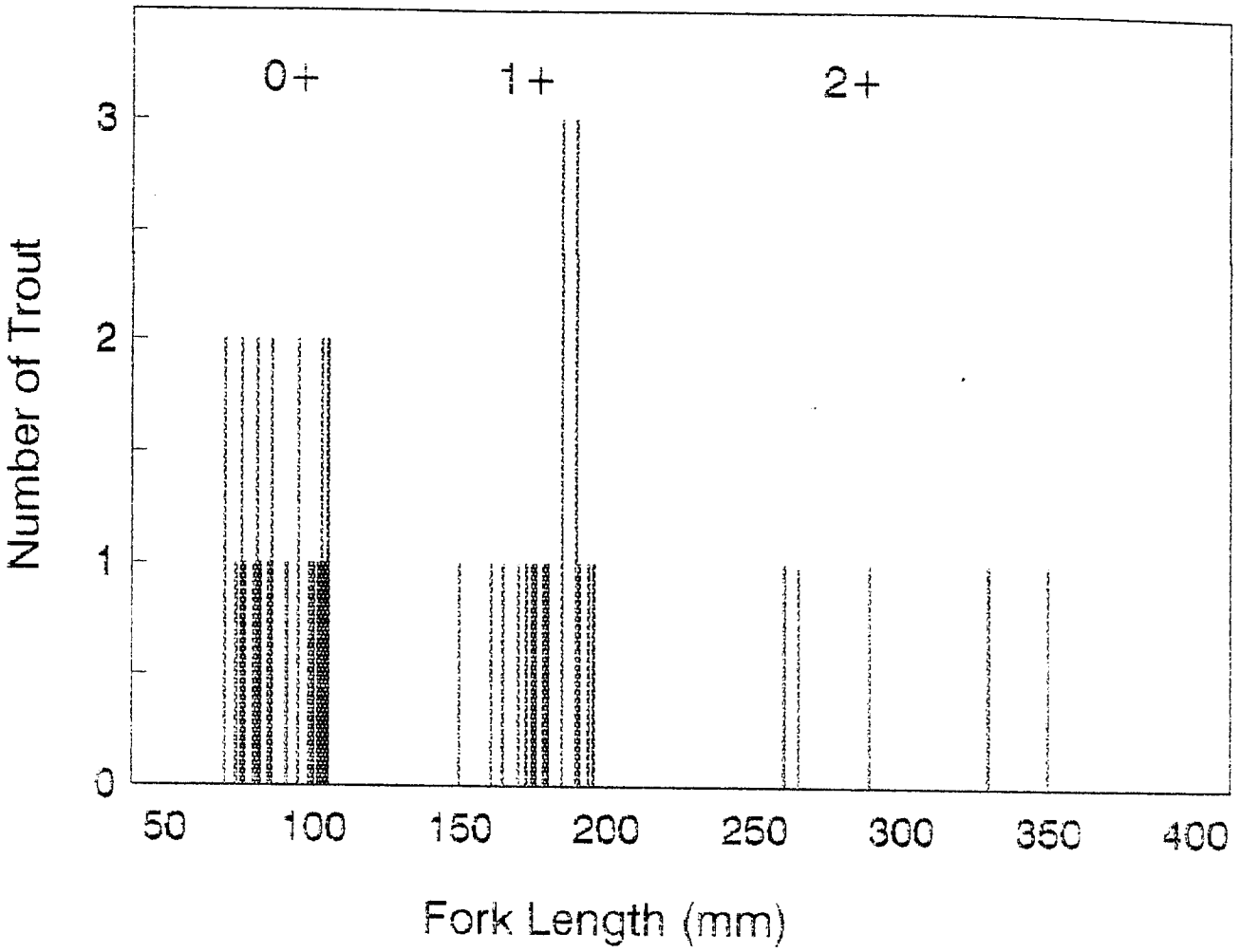

FIGURE 3. Length, observed frequency, and age of brown trout caught in Big Grizzly Creek, Plumas County, 1991.

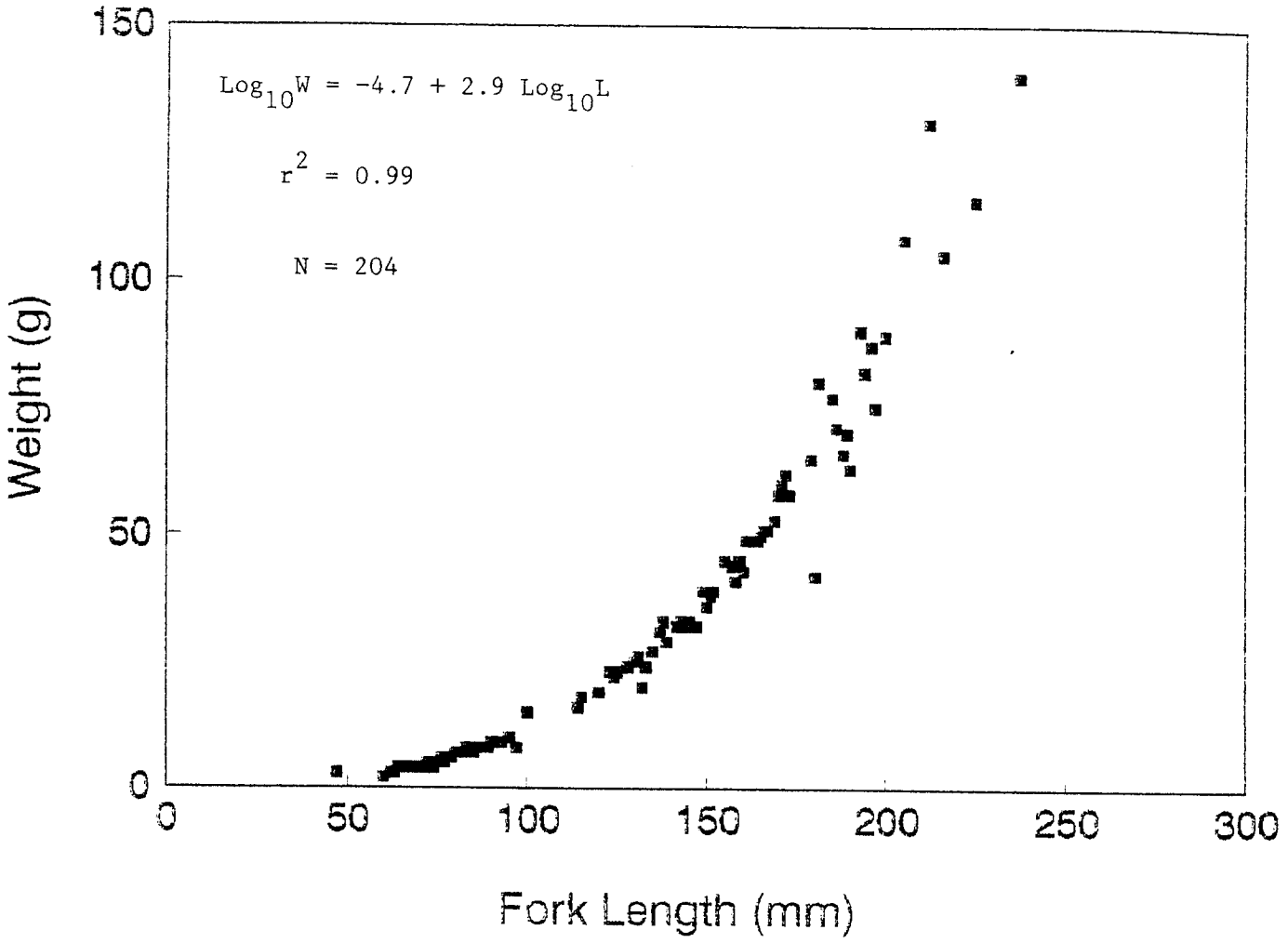

FIGURE 4. The relationship between length and weight of rainbow trout caught in Big Grizzly Creek, Plumas County, 1991.

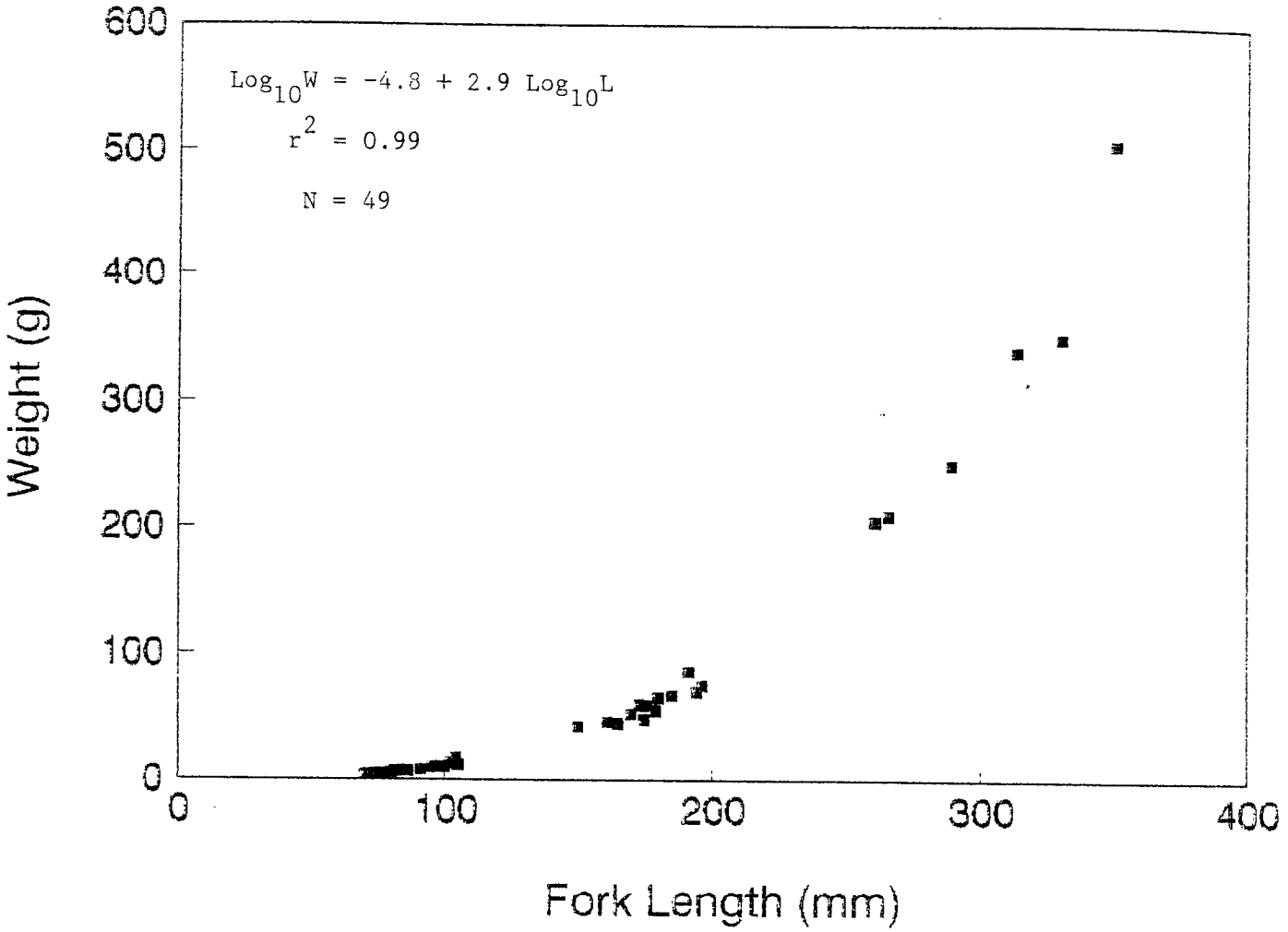

FIGURE 5. The relationship between length and weight of brown trout caught in Big Grizzly Creek, Plumas County, 1991.

Age and Growth

The formula L = -0.7 + 0.2 S describes the relationship between the fork length (L) and enlarged scale radius (S) of 114 rainbow trout caught in Big Grizzly Creek. The coefficient of correlation (r^2) is 0.56. The formula was L = 1.4 + 0.2 S for 24 brown trout, while the value for r^2 is 0.86.

Instantaneous population growth and instantaneous mean individual growth were the same for rainbow and brown trout (Tables 5 and 6).

TABLE 5. Growth Rates for Rainbow Trout Caught in Big Grizzly Creek, 1991.

	Population Growth			Mean Individual Growth		
Age	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate Gx	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate Gx
1-2	99-168	0.529	1.534	107-168	0.451	1.308

TABLE 6. Growth Rates for Brown Trout Caught in Big Grizzly Creek, 1991.

	Population Growth			Mean Individual Growth		
Age	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate Gx	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate Gx
1-2	97-190	0.529	1.534	123-190	0.451	1.308

Age 1+ rainbow trout averaged 173 mm fork length and age 2+ rainbow trout averaged 235 mm fork length (Table 7). Age 1+ and age 2+ brown trout averaged 169 mm and 278 mm, respectively (Table 8).

TABLE 7. Calculated Fork Length of Rainbow Trout from Big Grizzly Creek, 1991.

Age	Number of Fish	Length at Capture	Length at Successive Annulus 1	2
1	57	173	116	
2	7	235	121	186
Number of back-calculations			64	7
Weighted means (mm)			117	186
Increments (mm)			117	69

TABLE 8. Calculated Fork Length of Brown Trout from Big Grizzly Creek, 1991.

Age	Number of Fish	Length at Capture	Length at Successive Annulus 1	2
1	8	169	97	
2	5	278	123	190
Number of back-calculations			13	5
Weighted means (mm)			107	190
Increments (mm)			107	83

Coefficient of Condition

The average coefficient of condition for 204 rainbow trout was 1.0985 and 1.1180 for 49 brown trout. 0+ rainbow trout had slightly higher coefficients of condition than brown trout of the same age groups (Table 9).

TABLE 9. Condition of Rainbow Trout and Brown Trout in Big Grizzly Creek, 1991.

Age Group	Number of Fish	Coefficient of Condition	95% Confidence Interval
Rainbow trout			
0+	88	1.1661	0.9304-1.4018
1+	104	1.0679	0.8861-1.2497
2+	12	1.0304	0.7177-1.3431
Combined	204	1.0985	0.8661-1.3359
Brown trout			
0+	21	1.1585	0.9565-1.3606
1+	12	1.1269	0.8047-1.4491
2+	16	1.0605	0.8817-1.2393
Combined	49	1.1180	0.8719-1.3641

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APPENDIX 1

PERMANENT FISH POPULATION STATIONS FOR
BIG GRIZZLY CREEK, PLUMAS COUNTY
SEPTEMBER, 1991

Station 1 (Stream Gage Station) - Station 1 is located 2.5 stream km below Grizzly Valley Dam and just downstream from an abandoned USGS stream gage at an elevation of 1622 m MSL. The station is located 21 m downstream from the concrete weir of the stream gage (UTM) 170 167. The stream within the station is a steep rapid area (67%) with several split channels and small pocket pools that ends in a long, shallow pool (33%). It is 43.6 m long and has a surface area of 357.5 m^2 at 0.56 cms. Substrate is 75% boulders, 15% rubble, and 10% sand.

Station 2 (IFN Station) - Station 2 is 3.2 stream km below Grizzly Valley Dam. The site located at UTM 176 156 at an elevation of 1610 n MSL. The upper end of the station is a steep rapid (55%) followed by two deep pools (45%) separated by short rapids. The substrate is mostly rubble (60%), boulder (20%), gravel (10%), with areas of sand (10%) in the pools. The station is 71.1 m long with a surface area of 284.4 m^2 at 0.56 cms.

Station 3 (3-Mile Station) - Station 3 is located 4.8 km downstream from Grizzly Valley Dam at an elevation of 1549 m MSL at UTM 189 141. The station begins in a steep rapid followed by more gradual rapids (75%) with pocket pools and two larger pools (25%) near the lower end. Substrate is boulder (65%), rubble (20%), sand (10%), and gravel (5%). The station is 53.4 m long and has a surface area of 352.4 m^2 at 0.56 cms.

Station 4 (6-Mile Station) - Station 4 is located 9.7 km below Grizzly Valley Dam and 0.2 km above the confluence with the Middle Fork Feather River at an elevation of 1488 m MSL. It is located at UTM 205 106. The station begins in a rapid just above a large 0.7 m deep pool (33%) followed by several riffle areas (67%) and shallow pools with undercut banks and overhanging grass clumps. Substrate is rubble (10%), gravel (75%), bedrock (10%), and mud (5%). The station is 104.6 m long with a surface area of 543.9 m^2 at 0.56 cms.

APPENDIX 2

LENGTH AND NUMBER OF RAINBOW TROUT
CAUGHT IN BIG GRIZZLY CREEK, 1991

Fork Length (mm)	Frequency of Occurrence	Fork Length (mm)	Frequency of Occurrence
60	1	138	1
62	1	139	4
63	1	142	2
64	1	143	2
65	1	144	3
66	2	145	4
67	2	147	1
68	2	149	2
69	4	150	6
70	5	151	3
71	5	152	2
72	1	155	1
73	1	157	1
74	3	158	1
75	9	159	3
76	4	160	3
77	4	161	1
78	3	164	2
79	2	165	6
80	7	166	3
81	2	167	1
83	2	169	3
84	5	170	6
85	4	171	1
86	4	172	1
89	3	173	2
90	3	179	4
91	1	180	1
92	1	181	1
93	1	185	5
95	1	186	2
97	1	188	1
100	1	189	1
114	1	190	1
115	2	193	1
120	1	194	2
123	1	196	2
124	1	197	1
125	3	200	1
128	1	205	3
130	3	212	1
131	2	216	1
132	1	225	1
133	2	237	1
135	1		
137	2		

APPENDIX 3

LENGTH AND WEIGHT OF RAINBOW TROUT
CAUGHT IN BIG GRIZZLY CREEK, 1991

Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)
60	2	138	33
62	3	139	28,28,29,29
63	3	142	30,34
64	3	143	32,34
65	4	144	31,34,34
66	4,3	145	30,31,33,36
67	3,4	147	32
68	4,4	149	37,40
69	4,4,4,5	150	33,35,36,36,
70	4,4,4,4,4		36,41
71	4,4,4,5,5	151	37,39,41
72	5	152	38,39
73	5	155	45
74	4,4,5	157	44
75	5,5,5,5,5,	158	41
	5,5,6,6	159	39,48,48
76	5,5,6,6	160	38,45,46
77	5,5,5,6	161	49
78	6,6,6	164	48,49
79	5,6	165	46,49,50,50,
80	5,6,6,6,7,		52,55
	8,8	166	46,52,54
81	6,7	167	51
83	8,8	169	51,52,57
84	6,7,7,7,8	170	53,54,54,60,
85	7,7,7,8		60,67
86	7,7,8,9	171	60
89	8,8,9	172	62
90	8,8,10	173	55,60
91	9	179	60,64,70,72
92	9	180	42
93	9	181	80
95	10	185	72,75,76,78,
97	8		78
100	15	186	65,77
114	16	188	66
115	16,19	189	70
120	19	190	63
123	23	193	90
124	22	194	78,86
125	22,23,25	196	84,94
128	24	197	75
130	23,26,26	200	89
131	24,28	205	104,106,115
132	20	212	131
133	23,25	216	105
135	27	225	116
137	29,32	237	140

APPENDIX 4

LENGTH AND NUMBER OF BROWN TROUT CAUGHT IN BIG GRIZZLY CREEK, 1991

Fork Length (mm)	Frequency of occurrence
70	2
74	1
76	2
77	1
80	1
81	2
82	1
85	1
86	2
91	1
95	2
99	1
100	1
102	1
103	2
104	1
105	3
150	1
161	1
165	1
170	1
173	1
175	1
176	1
179	1
180	1
185	3
190	3
191	1
194	1
196	1
260	1
265	1
289	1
313	1
330	1
350	1

APPENDIX 5

LENGTH AND WEIGHT OF BROWN TROUT
CAUGHT IN BIG GRIZZLY CREEK, 1991

Fork Length (mm)	Displacement (ml)
70	4,4
74	5
76	5,5
77	5
80	6
81	6,8
82	7
85	7
86	7,8
91	8
95	9,10
99	10
100	10
102	14
103	13,13
104	17
105	12,12,13
150	42
161	46
165	45
170	52
173	60
175	48
176	59
179	55
180	65
185	60,69,70
190	63,66,72
191	86
194	70
196	75
260	205
265	210
289	250
313	340
330	350
350	505